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Acceleration time and Low Flow, Low Gradient, Severe Aortic Stenosis: Correlation and Prediction of Valve Area

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BACKGROUND Low flow, low gradient, aortic stenosis is becoming increasingly recognized as a subgroup of severe aortic stenosis. Acceleration time (AT) has been correlated with severity of severe aortic stenosis (AS). We examined the epidemiology of Low flow, low gradient (LF/LG) severe AS and the correlation with AT to predict the valve area.

METHODS We studied 138 consecutive patients diagnosed with severe AS and normal ejection fraction (>55%) by echocardiography. The mean age was 81±10 yrs; 66% were females, 63% were African Americans and 86% had hypertension. Chi square test was used for comparing binary variables; student t-test for comparing means, and linear regression was performed using IBM SPSS.

RESULTS 47 (34%) patients had stroke volume index < 35 and 28 (20%) had low flow and low aortic mean gradient (<40 mmHg). There were no significant differences in gender and race distribution or past medical history in the groups divided based on LF/LG. The aortic valve area by continuity equation was 0.74±0.16 vs 0.73±0.14, nor was there a difference in AVA index, dimensionless index or EF. Mean gradient (45±16 vs 27.5±7 mmHg), as did peak gradient (73±23 vs 48±12 mmHg), stroke volume index (42.4±10 vs 28±5 ml/m2), ZVA (4.3±1.4 vs 5.4±1.8), average AT (113±20 vs 94±16 ms) and average ejection time (316±31 vs 292±37 sec) were significantly different (p value <.01). AT significantly and negatively correlated with AVA index in both the LF/LG (r -0.368, p <.01), and rest of the cohort group (r -0.414, p <.01). Adjusted for age, gender, race, and ejection fraction using linear multivariate regression analysis, AT and LF/LG were significant predictors of AVA index.

Parameter	Coefficient	SE	P Value
(Constant)	.603	.047	
Female	.044	.017	<.01
Acceleration time(AT)	-1.913	.402	<.01
LF/LG	-.068	.021	<.01

CONCLUSIONS Acceleration time is significantly correlated with AVA index derived from the continuity equation in both traditional severe AS and in LF/LG severe AS, and is an independent predictor of AVA index. The utility of AT in differentiating the severe from moderate AS in LF/LG group needs to be evaluated.

CATEGORIES STRUCTURAL: Valvular Disease: Aortic

KEYWORDS Aortic valve stenosis, Low-Flow, Flow-Gradient Aortic Stenosis

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Outcomes in Patients with Transcatheter Aortic Valve Replacement and Left Main Stent: The multicenter, multinational TAVR-LM Registry

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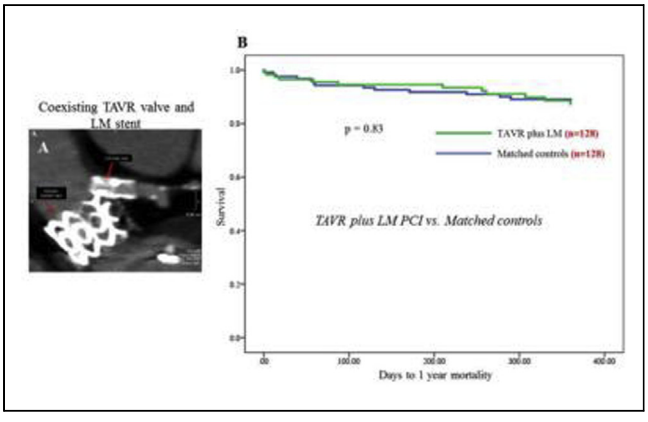
BACKGROUND A percutaneous approach with transcatheter aortic valve replacement (TAVR) and percutaneous coronary intervention (PCI) of the left main (LM) is frequently utilized in high-risk patients with coexisting aortic stenosis and LM disease. Outcomes of TAVR plus LM PCI (Figure 1A) have not been previously reported. The primary objective of the TAVR-LM registry is to evaluate the clinical outcomes in patients undergoing TAVR plus LM PCI.

METHODS We retrospectively collected clinical, echocardiographic, computed-tomographic and angiographic characteristics in 204 patients undergoing TAVR plus LM PCI. One-hundred twenty-eight matched patient pairs were generated by performing 1:1 case-control matching between 167 patients with pre-existing LM stent undergoing TAVR and 1188 control patients undergoing TAVR without LM revascularization.

RESULTS One-year mortality (9.4% vs. 10.2%, p = 0.83) was similar between the TAVR plus LM PCI cohort and matched controls (Figure 1B). One-year mortality after TAVR plus LM PCI was not different among patients with unprotected, compared to protected LM (7.8% vs. 8.1%, p = 0.88); among those with ostial versus non-ostial LM stents (10.3% vs. 15.6%, p = 0.20); and among those undergoing LM PCI within 3 months, compared to those with LM PCI greater than 3 months prior to TAVR (7.4% vs. 8.6%, p = 0.61). Unplanned LM PCI performed due to TAVR-related coronary complication, compared to planned LM PCI performed for pre-existing LM disease, resulted in increased 30-day (15.8% vs. 3.4%, p = 0.013) and 1-year mortality (21.1% vs. 8.0%, p = 0.071).



CONCLUSIONS Despite the anatomic proximity of the aortic annulus to the LM coronary artery, TAVR plus LM PCI is safe and technically feasible, with short- and intermediate-term clinical outcomes comparable to patients undergoing TAVR alone. Our results suggest that TAVR plus LM PCI is a reasonable option for patients who are at high risk for surgery.

CATEGORIES STRUCTURAL: Valvular Disease: Aortic

KEYWORDS Left main coronary artery disease, TAVI, PCI, Aortic stenosis, CAD, TAVR

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Transcatheter Heart Valve Underexpansion Patterns

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BACKGROUND The size of the transcatheter heart valves (THV) is overestimated up to 20% based on aortic annulus diameter measured using computed tomography (CT). However, the prosthesis may not be fully expanded during implantation. THV underexpansion might have detrimental clinical consequences. The aim of this study was to define the degree of underexpansion degree of different THVs, introduced as the shrinking index, and its predicting role in pacemaker implantation after transcatheter aortic valve implantation (TAVI).

METHODS We enrolled 112 patients (68 men, 79±8 years old) who underwent TAVI with the self-expanding CoreValve (n=28), mechanically expanded Lotus valve (n= 35) or balloon expandable Edwards SAPIEN XT (n=18) and Edwards SAPIEN 3 (n= 31). The cover index of the THV was calculated as the percentage difference of the nominal prosthesis size and annulus diameter measured using CT. Intraprocedural transesophageal echocardiography (TEE) was performed to determine the size of the THV inflow after implantation. The shrinking index was calculated as the percentage of the difference between the inflow size by TEE and the nominal prosthesis size divided by prosthesis size. After excluding the patients with baseline pacemaker (n=7) and patients deceased within 24 hours after TAVI (n=4), the role of the shrinking index for pacemaker implantation within 30 days was investigated.

RESULTS Cover index per CT assessment was 18±7% for CoreValve, 2±4% for Lotus, 9±5% for Edwards SAPIEN and 4±5% for Edwards SAPIEN 3 (ANOVA $p<0.001$, Corevalve was significantly larger than the others). Compared with aortic annulus diameter measured using TEE in long axis view, the overestimation increased to 28±9% for CoreValve, 12±8% for Lotus, 18±12% for Edwards SAPIEN and 12±8% for Edwards SAPIEN 3 (ANOVA $p<0.001$, Corevalve was significantly larger than the others). Conversely, the shrinking index after TAVI was -30±6% for CoreValve, -20±5% for Lotus, -22±6% for SAPIEN XT and -19±5% for SAPIEN 3 (ANOVA $p<0.001$, Corevalve was significantly larger than the others). The interobserver variability (relative difference) of TEE in measuring the aortic annulus and prosthesis inflow was 6±5% and 7±5% respectively. Using a cut-off value of -22% of the shrinking index, the pacemaker implantation rate was of borderline difference between patients with shrinking index lower than -22% (pacemaker implantation rate 65%) and those higher than -22% (35%) (univariate analysis $p=0.06$). However, there was no significant difference within each type of THV.

CONCLUSIONS The shrinking index determines the degree of THV underexpansion after TAVI and can be reliably measured with TEE. The self-expanding CoreValve tended to be under-expanded the most, indicated by the largest shrinking index. THV with a shrinking index larger than 22% tended to predict higher pacemaker implantation rate after TAVI. Its definite predicting role needs further study with larger patient population and more covariables included.

CATEGORIES STRUCTURAL: Valvular Disease: Aortic

KEYWORDS TAVI, TEE

TCT-654

Balloon vs Computed Tomography Sizing of the Aortic Annulus for Transcatheter Aortic Valve Replacement

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BACKGROUND Mutidetector cardiac computed tomography (MDCT) is the gold standard for aortic annular sizing in transcatheter aortic valve replacement (TAVR). Balloon sizing is increasingly used in patients when there remains a discrepancy in preoperative assessment for the most appropriate valve size that should be utilized. A comparison between balloon and MDCT sizing has not been reported.

METHODS We retrospectively reviewed 205 patients undergoing balloon-expandable TAVR who underwent preoperative annular MDCT or intraoperative balloon sizing. Baseline characteristics and 30-day outcomes are compared between groups. Logistic regression modules were used to compare paravalvular leak (PVL) rates adjusting for access site (TF or non-TF), valve type (SAPIEN or SAPIEN XT), size (23, 26, or 29), and valve calcification.

RESULTS 205 patients underwent TAVR with MDCT (n=110) or balloon sizing (n=95). Balloon sized patients were older (83 vs. 81 years, $p=0.03$), with more valve calcification (60.2% vs. 30.9%, $p<0.001$), and underwent more minimalist TAVR (61.1% vs. 40%, $p=0.03$). Balloon-sized patients also received less 29 mm valves (9.5% vs. 29.1%, $p=0.001$) and more intraprocedural balloon valvuloplasties (2 vs. 1, $p=0.001$), fluoroscopy time (25.6 vs. 20.3 min, $p=0.001$), and intra-procedural contrast (130.0 vs. 108 mL, $p=0.01$). Though we found no difference between balloon and MDCT sizing in rates of acute renal failure, annular rupture, and $\geq$ mild PVL by angiography or 30-day TTE; balloon sized patients had a higher aortic regurgitation index (Table 1). 30-day rates of $\geq$ moderate PVL were 7.0% with balloon and 5.7% with MDCT sizing ($p=0.34$). Balloon sizing recommended a different valve size in 34% patients that underwent both sizing methods (n=50).